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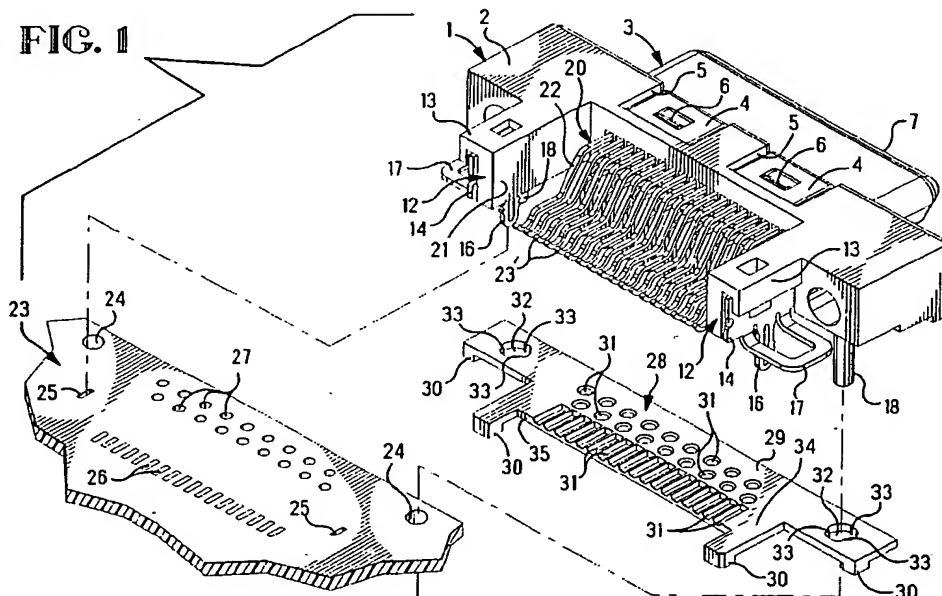
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**London W8 5BU (GB)**(54) **Pin spacer for an electrical connector**

(57) A pin spacer (28) for an electrical connector (1) comprises, an insulating plate (29), pin alignment walls (31) on the plate to engage and align pin portions (22) on electrical contacts (20) projecting from a housing (2) of the electrical connector (1),

and post gripping guides (33) on the plate (28) to secure the plate (28) on gripped keying posts (18) on the electrical connector (1), and to align the pin portions (22) relative to the posts (18).

**FIG. 1**

The invention relates to a pin spacer for an electrical connector, and more particularly, to a pin spacer that accurately aligns pin portions on electrical contacts for connection to a circuit board.

According to a known electrical connector, keying posts on an underside of an insulating housing of the connector are adapted to register in apertures in a circuit board. The posts in the apertures accurately position the housing relative to the circuit board. Pin portions on electrical contacts project from the housing for connection to conductive areas arranged in a pattern on the circuit board. The conductive areas are on the surface of the circuit board for connection to surface mount contacts. The conductive areas are in apertures through the circuit board for connection to aperture mounted contacts.

According to U.S. Patents 4,649,387 and 5,129,832, a pin spacer aligns pin portions of electrical contacts accurately with conductive areas arranged in a pattern on a circuit board. The pin spacer engages and aligns the pin portions where they project from a housing of an electrical connector. According to U.S. Patent 4,842,528, a pin spacer can be constructed unitary with the housing of the connector. A unitary pin spacer assures accurate location of the pin spacer relative to the housing of the connector. However, a unitary pin spacer retires a complicated assembly operation, according to which, the electrical contacts are first inserted in the housing of the connector, and subsequently, the pin portions of the contacts are bent to move them into alignment against the pin spacer.

A pin spacer can be constructed as a separate part. This construction allows adjustment of the pin spacer to a desired position relative to the pin portions. However, the pin spacer, being a separate part, is subject to misalignment relative to the housing of the connector. Such misalignment of the pin spacer causes misalignment of the pin portions relative to a pattern of conductive areas on the circuit board.

An advantage of the invention resides in a pin spacer that will accurately align pin portions on electrical contacts with a pattern of conductive areas on a circuit board.

Another advantage of the invention resides in a pin spacer that will accurately align pin portions that are surface mount terminals.

Another advantage of the invention resides in a pin spacer that will accurately align pin portions that are either surface mount terminals or through hole mounted contacts.

Another advantage of the invention resides in a pin spacer that accurately aligns pin portions on electrical contacts relative to an electrical connector, and specifically, relative to keying posts on an

electrical connector.

An embodiment of a pin spacer for an electrical connector is adapted for engaging keying posts of an electrical connector and to align pin portions on electrical contacts. Another embodiment comprises self centering guides that first, capture keying posts on an electrical connector to align the pin spacer relative to the posts, and then, grip the posts to secure the pin spacer in place on the gripped posts. The embodiment engages pin portions on electrical contacts, aligning the pin portions relative to the posts.

An embodiment of a pin spacer for an electrical connector is adapted with pin alignment walls along apertures to align aperture mounted electrical contacts with apertures in a circuit board.

An embodiment of a pin spacer for an electrical connector is adapted with pin alignment walls along coplanar recesses to align surface mount electrical contacts for surface mount connection to a circuit board.

An embodiment of the invention will now be described by way of example with reference to the accompanying drawings, according to which:

FIGURE 1 is a perspective view of an electrical connector and a pin spacer;

FIGURE 2 is a perspective view of the connector and the pin spacer, as shown in Fig. 1, upside down, or inverted; and

FIGURE 3 is a view similar to Fig. 2, illustrating the pin spacer assembled to the connector and aligning pin portions of surface mount contacts and through hole contacts.

With reference to Fig. 1, an electrical connector 1 comprises, an insulating housing 2 of unitary construction. A metal, stamped and formed shield 3 is attached by hasps 4 that register in recesses 5 in the housing 2 and latch onto projections 6 on the housing 2. The shield 3 provides an encircling shroud 7 over a front of the housing 2. With reference to Fig. 2, the shield 3 has additional hasps 4 and extended grounding legs 8 that are bent to lie against a raised step 9 on an underside 10 of the housing 2. Projecting feet 11 extend from the step 9 to provide a bottom of the connector 2. With reference to Figs. 1 and 2, a pair of spaced apart board locks 12 extend rearward and also below the housing 2. Each of the board locks 12 comprises, a rearward extending wall 13 on the housing 2, and a metal grounding element 14 mounted within a slot 15 in the wall 13. On each grounding element 14 is a through hole, grounding post 16 with barbs thereon extending outwardly beyond the bottom of the housing 2. A surface mount leg 17 on the board lock 12 extends laterally with respect to the bottom of the housing 2, and level with the bottom of the housing 2. The grounding element 14 is adapted for surface mounting, by severing and removing

the grounding post 16, leaving the surface mount leg 17 on the grounding element 14. The surface mount legs 17 are adapted to be severed and removed, to leave the grounding posts 16 on the grounding element 14.

With reference to Fig. 2, keying posts 18 project from the bottom of the housing 2. Each of the keying posts 18 has a smaller circumference at the free end and along a substantial length, and a larger circumference 19 on an enlarged portion adjacent to the underside 10.

With reference to Figs. 1 and 2, electrical contacts 20 extend through the housing 2 toward the front of the housing 2. The contacts 20 extend rearward and emerge in an opening 21 in the housing 2 between the board locks 12 on the housing 2. Pin portions 22 of the contacts 20 within the opening 21 are distributed in three rows. The pin portions 22 in an outer, first row of pin portions comprises, surface mount terminals having curved contact surfaces along cantilever beams. The pin portions 22 along inner, second and third rows of the pin portions 22 comprise; elongated, through hole, posts extending at right angles to the bottom of the housing 2.

With reference to Fig. 1, a circuit board 23, a portion of which is shown, is adapted with spaced apart mounting apertures 24 to receive the keying posts 18 to orient as well as to mount the housing 2 with the bottom of the housing 2 against the circuit board 23. The keying post 18 provide mounting posts for the housing 2. The bottom of the connector 1 on the feet 11 register against the circuit board 23, while the feet 11 elevate the underside 10 of the housing 2 above the circuit board 23 to facilitate the passage of cleaning fluids. The circuit board 23 is adapted with plating lined apertures 25 to receive and electrically connect with the posts 16 of the board locks 12. The circuit board 23 is adapted with a pattern of conductive areas for connection to respective contacts 20 in the housing 2. The conductive areas comprise, a first row of surface mount pads 26 on the surface of the circuit board 23 adapted for connection by solder, not shown, to respective curved contact surfaces 23 on the surface mount terminals on the outer row of the pin portions 22. Second and third rows of plating lined openings 27, or apertures, through the thickness of the circuit board 23 are adapted for connection by solder, not shown, to respective through hole mounted posts on the two inner rows of pin portions 22. An objective of the invention is to align the pin portions 22 of the contacts 20 for accurate placement on the pattern of conductive areas. Another objective of the invention is to align the pin portions 22 of the contacts 20 relative to the keying posts 18, whereby, dimensions for locating the pin portions 22 are referen-

ced from the dimensions that locate the keying posts 18.

With reference to Figs. 1 and 2, an insulative pin spacer 28 of unitary construction is generally in the form of a plate 29. The thickness of the pin spacer 28 is enlarged in various locations to provide projecting stand offs 30, or feet, adapted to register against the circuit board 23 and raise the pin spacer 28 away from the circuit board 23 to facilitate the passage of cleaning fluids.

The pin spacer 28 is adapted for aligning the through hole mounted pin portions 22 of respective electrical contacts 20. The pin spacer 28 is adapted with pin alignment walls 31 within individual openings through the pin spacer 28. The openings are arranged in a pattern that matches the pattern of the plating lined apertures 25. The walls 31 receive respective, through hole mounted pin portions 22 in the openings. The walls 31 are arranged in a number of rows of openings, corresponding with the number of rows of through hole, mounted pin portions 22. For example, the through hole mounted pin portions 22 can be mounted in a single row, in which case, the walls 31 are arranged in at least one row of openings. In the embodiment, the walls 31 are arranged in two rows of openings corresponding to the two rows of through hole mounted pin portions 22. Accordingly, the pin spacer 28 is adapted with pin receiving openings to align the through hole mounted pin portions 22 with respective plating lined openings 27 through the circuit board 23.

The pin spacer 28 is assembled onto the keying posts 18 of the connector 1 to align the pin portions 22 with respect to the keying posts 18. Post receiving openings 32 through the thickness of the pin spacer 28 are aligned with and receive the keying posts 18. A set of post gripping guides 33, in the form of fingers, project radially inward from the circumference of each of the post receiving openings 32. The circumference of each post receiving opening 32, as well as a circumference circumscribed by the post gripping guides 33, both, are larger than the smaller circumference of a corresponding keying post 18, to allow significant lateral movement of the pin spacer 28 while received over the smaller circumference of each keying post 18. Such lateral movement enables the pin spacer 28 to deflect misaligned pin portions 22 into alignment without undo restriction of such movement by the keying posts 18.

The pin spacer is 28 displaced along the keying posts 18 until the gripping guides 33 grip the larger circumferences of the posts 18. During such displacement, the post gripping guides 33 center the axes of the post receiving openings 32 with the centerlines of the posts 18. The post gripping guides 33 center the openings 32 over the larger

circumferences 19 of the posts 18 and wedge the posts 18 in the openings 32 to secure the plate 29 on the gripped keying posts 18. Accordingly, the openings 32 receive the posts 18 with a wedge fit. The plate 29 will register against the underside 10 of the housing 2 beneath the level of the step 9.

With reference to Figs. 1 and 2, the pin spacer 28 is adapted to align the pin portions 22 comprising the solder mount terminals in the outer row of pin portions 22. The pin spacer 28 is adapted with pin alignment walls 31 along the bottoms of pin receiving, grooved recesses arranged in a pattern that matches the pattern of conductive pads 26 for surface mounting of the contact surfaces 23 on the solder mount terminals. The recesses are in a top surface 34 of the plate 29 and extend to an opening 35 through the thickness of the plate 29. In the embodiment, the opening 35 is located at a rear edge of the plate 29. The recesses are between said opening 35 at the edge of the plate 29 and the walls 31 in the pin receiving openings. When the pin spacer 28 is displaced along the keying posts 18, the pin alignment walls 31 in the grooved recesses receive respective pin portions 22 comprising the solder mount terminals. The walls 31 in the recesses engage the solder mount terminals.

When the pin spacer 28 is displaced along each of the posts 18 toward the enlarged circumference 19 of each of the posts 18, the walls 31 in the grooved recesses resiliently bias the solder mount terminals upward to elevated, final positions. Thereby, the solder mount terminals are aligned relative to the keying posts 18. The resiliently deflected solder mount terminals exert compression against the pin alignment walls 31, and thereby, are retained in fixed positions against the pin alignment walls 31 of the pin spacer 28.

The curved contact surfaces 23 of the solder mount terminals extend over, or overhang, the opening 35 at the rear edge of the plate 29 in alignment with the conductive pads 26. The contact surfaces 23 exert pressure against the pads 26 to facilitate joining to the pads 26 with solder. The thickness of the pin spacer 28 below the alignment walls and adjacent to the opening 35 is chosen and fabricated according to controlled manufacturing tolerances to control the elevation of the contact surfaces 23, and the position of the contact surfaces 23 relative to the bottom of the connector 1. In turn, the consequent pressure exerted by the contact surfaces 23 against the pads 26 is controlled. The thickness of the pin spacer 28 against the surface mount terminals is uniform to assure that the contact surfaces 23 are uniform in elevation to provide uniform pressure against the pads 26.

## Claims

1. A pin spacer (28) for an electrical connector (1) comprising an insulating plate (29) characterised in that: pin alignment walls (31) on the plate (24) engage and align pin portions (22) on electrical contacts (20) projecting from a housing of an electrical connector (1), and post gripping guides (33) on the plate (28) secure the plate (28) on gripped keying posts (18) on an electrical connector (1), and the guides (33) align the pin portions (22) relative to the posts (18).
2. A pin spacer as recited in claim 1 comprising: projecting standoffs (30) on an underside of the plate (29) to elevate the plate relative to a circuit board (23).
3. A pin spacer as recited in claim 1 wherein, the post gripping guides comprise, openings (33) aligned with keying posts (18) on the connector, and the openings (33) being adapted to receive the posts (18) with a wedge fit.
4. A pin spacer as recited in claim 1 wherein, the post gripping guides comprise, openings (32) receiving keying posts (18) on the connector (1), and radially inward fingers (33) in the openings (32) to center the openings over respective posts (18).
5. A pin spacer as recited in claim 1 wherein, the pin alignment walls (31) extend along grooved recesses in the plate (28) and to an edge (35) of the plate, and the walls (31) align respective electrical contacts (20) along the recesses, and with electrical contact surfaces (23') of the contacts extending over an opening through the plate (28) for connection to a circuit board (23).
6. A pin spacer as recited in claim 1 wherein, pin alignment walls extend along openings (31) through the plate, and the walls align respective pin portions (22) of electrical contacts (20) extending through the openings.
7. A pin spacer as recited in claim 1 wherein, the pin alignment walls (31) comprise; first walls extending along openings through the plate the first walls aligning first pin portions (22) of respective electrical contacts extending through the openings for connection to a circuit board, and second walls (31) extending along recesses in the plate (28), the recfesses extending to an edge of the plate (28), and the second walls align second pin portions (23') of

respective electrical contacts along the recesses, with electrical contact surfaces of the second pin portions (23') extending over an opening (35) through the plate for connection to a circuit board (23).

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8. A pin spacer as recited in claim 7 wherein, the openings are in at least one row, the openings are spaced from said opening (35) through the plate (28), and the grooved recesses are between said opening (35) through the plate and the openings in said row.

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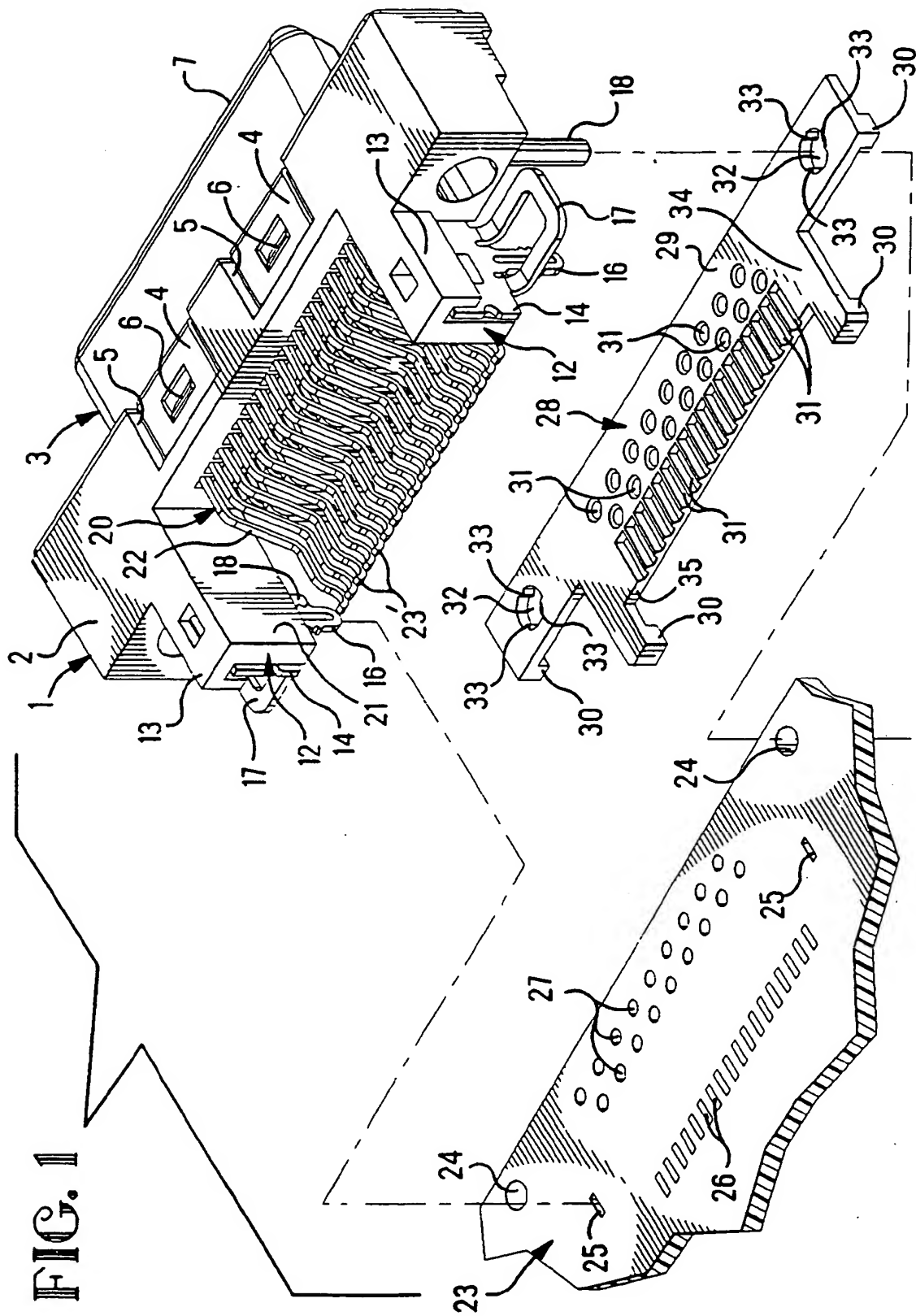
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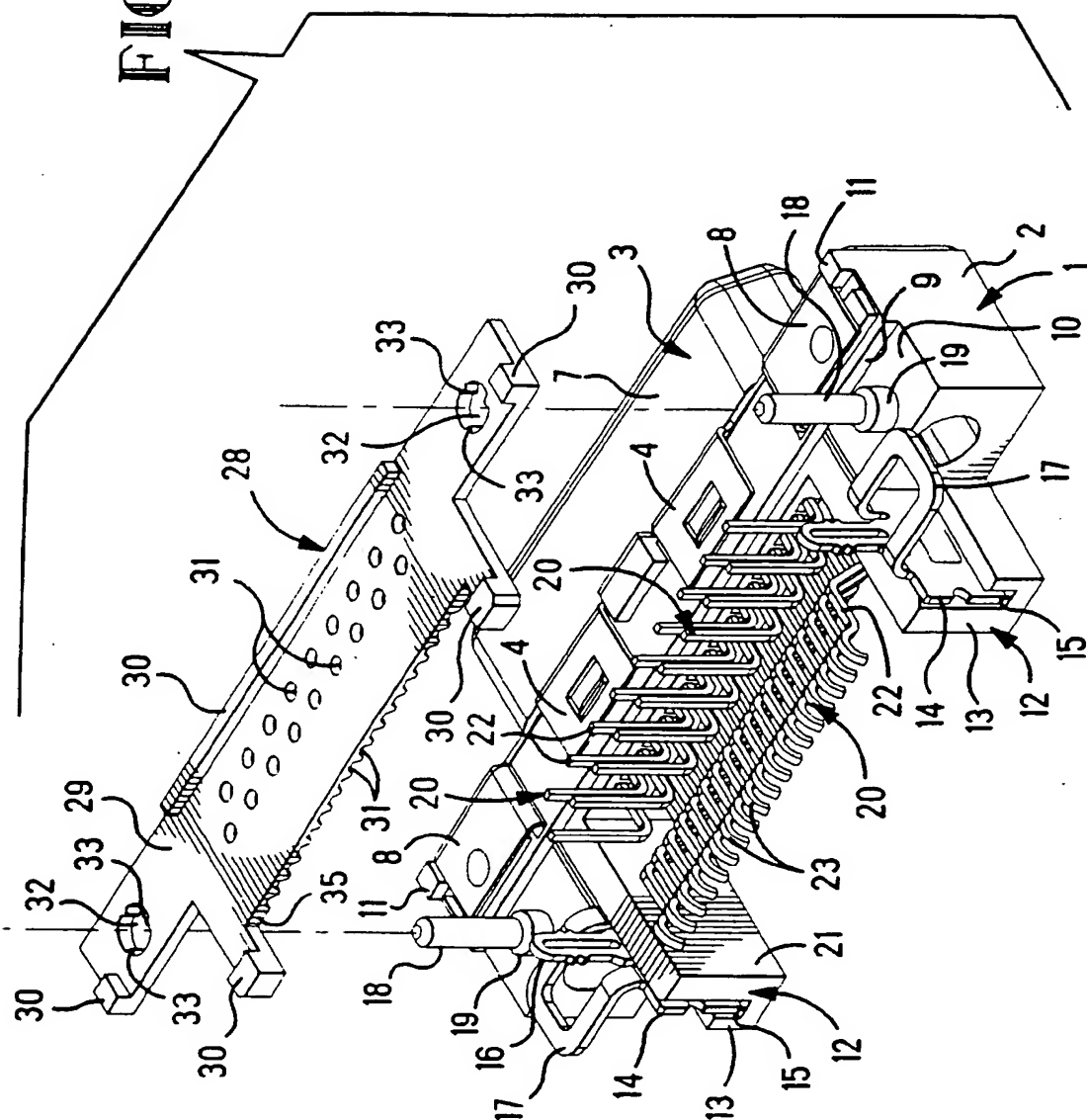
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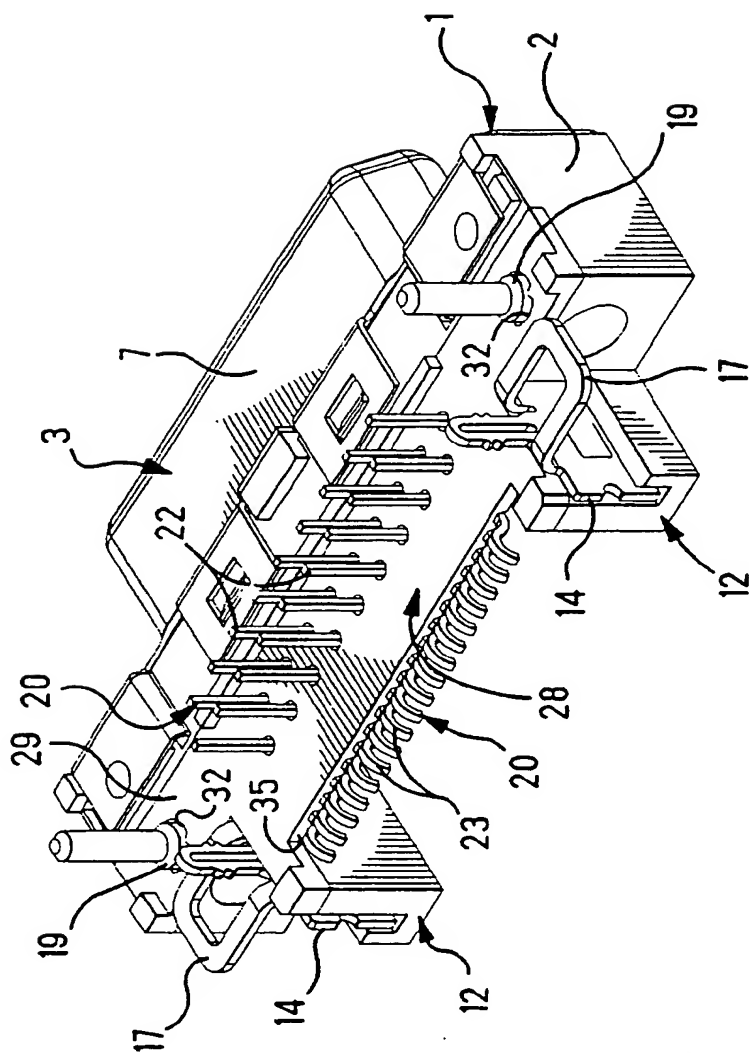
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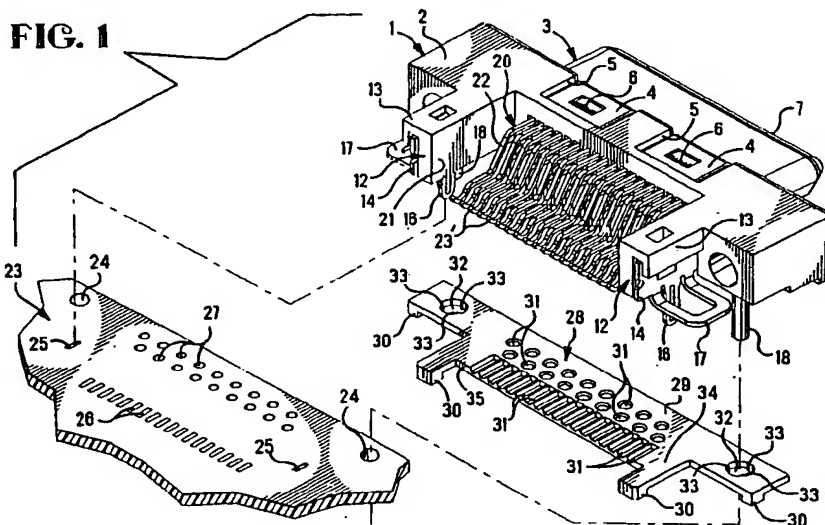
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# EUROPEAN SEARCH REPORT

Application Number  
EP 95 30 3240

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	US 5 104 326 A (SMITH JAMES ET AL) 14 April 1992 * abstract; claims; figures * ---	1,3-7	H01R9/09 H01R13/658 H01R23/70
A	US 4 986 772 A (FUKUTANI IWA0) 22 January 1991 * abstract; claims; figures * ---	1-7	
A	EP 0 520 283 A (DU PONT) 30 December 1992 * abstract; claims; figures * ---	1,3-7	
A	EP 0 471 219 A (AMP INC) 19 February 1992 * abstract; claims; figures * ---	1-7	
A	US 5 004 430 A (DELGUIDICE HENRY L ET AL) 2 April 1991 -----		
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			H01R
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
THE HAGUE	2 April 1997	Durand, F	
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document			

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